

7.—CARMINITE AND BINDHEIMITE FROM THE ASHBURTON DISTRICT.

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Read 18th April, 1939; Published 25th August, 1939.

CARMINITE, HARDEY RIVER.

Carminite, a hydrous arsenate of lead and iron, was first reported by Sandberger, who found it associated with beudantite and quartz in limonite from Horhausen on the Rhine. He named it Karminsplat from the red colour, but later Dana adopted the name Carminite. Carminite has also been reported from Cornwall, Utah, Colorado, and from the Magnet Silver mine in Tasmania, but this last occurrence is held by Anderson (1) to be actually Crocoite. The rather complex formula, $Pb_3As_2O_8 \cdot 10FeAsO_4$, suggested by Dana, Doelter and others, is necessarily tentative, as it is based on one analysis made on ·07 gm. of material; further it does not indicate any combined water.

In 1937, W. F. Foshag (2) published an analysis of carminite from Mapimi, Mexico, where it occurs associated with scorodite, dussertite, arseniosiderite, mimetite, cerussite, anglesite and plumbojarosite. He was able to obtain sufficient reasonably pure material for an accurate analysis, and simplified the formula to $PbO \cdot Fe_2O_3 \cdot As_2O_5 \cdot H_2O$.

The West Australian mineral which forms the subject of this paper was received at the Government Laboratory at the end of 1937 from a locality given as near the Log Hut on Wyloo Station, 30 miles E.S.E. of Mt. McGrath, and two miles south of the Hardey River in Lat. $22^{\circ}55''$ S., Long. $116^{\circ}35''$ E.

In the hand specimen the mineral in considerable masses has a scoriaceous appearance and brick red colour; it also occurs as incrustations in vughs. It is associated with scorodite, anglesite, galena, quartz and possibly beudantite. Under the microscope it is translucent, and is red to amber in colour; it is usually massive, but prism shaped crystals were observed. These are often in sheaf-like forms and are rarely more than ·1 x ·03 mm., with acute termination and straight extinction. The lowest refractive index is higher than that of methylene iodide (1·74) and the birefringence is moderate. Pleochroism is not marked.

The specific gravity of the mineral analysed was 5·22. H.5. An analysis of the purest mineral obtainable after eliminating 0·62 per cent. quartz is given below, with that of the Mapimi material for comparison.

(1) Records of the Australian Museum, 1906, pp. 133-144. (2) The American Mineralogist, Vol. 22, No. 5., 1937, p. 479.

ANALYSES OF CARMINITE.

		Hardey River.		Mapimi.
	%	Mols.	%	Mols.
PbO	38.14	1,707	37.30	1,675
Fe ₂ O ₃	23.07	1,445	23.43	1,467
FeO	tr.	...	.21	.29
As ₂ O ₅	33.22	1,446	33.98	1,426
P ₂ O ₅	.30	.21	n.d.	...
H ₂ O+	3.71	2,061	2.90	1,687
H ₂ O—	*	...	.10	...
SO ₃	1.35	168	n.d.	...
CaO	nil	...	.44	78
MgO	nil	...	.06	15
Al ₂ O ₃	n.d.	...	.96	94
Insol.	...	...	.58	...
Total	99.80	...	99.96	...

* Analysis made on mineral dried at 100°C.

Assuming that the P₂O₅ replaces As₂O₅ in the molecule, and that the SO₃ is combined with PbO in the form of anglesite, the result comes very close to the simple formula put forward by Foshag, with the exception that the water is somewhat higher, $\frac{1}{2}$ molecules as against one molecule.

SUMMARY AND CONCLUSIONS.

A description and chemical analysis is given of the mineral carminite from the Ashburton District.

The formula deduced corresponds very closely with that given by W. F. Foshag to the Mapimi mineral and may reasonably be adopted.

This appears to be the first authenticated occurrence of carminite in Australia.

BINDHEIMITE—MT. AMY AND GORGE CREEK.

This hydrated antimonate of lead is found associated with silver lead ores in many parts of the world, occurring in Australia in the Barrier Ranges of New South Wales, and in Tasmania, but has not previously been reported from Western Australia.

In 1937 specimens of the mineral were received at the Government Laboratory from two localities in the Ashburton District, (1) from Colvin's lead show at Gorge Creek in Lat. 23°15' S. and Long. 116°40' E., 12 miles S.E. of Mt. Dawson (also called Mt. Mortimer) : (2) from P.A. 150 in Lat. 22°16' S. and Long. 115°52' E., 3½ miles S.E. of Mt. Amy, about 80 miles in a north-westerly direction from Mt. Dawson.

In both cases the mineral occurs as a filling of cavities in a granular mass of cerussite, anglesite and quartz and is contaminated with kaolin, limonite and alunite. In the hand specimen the appearance is earthy, and the colour corresponds to Ridgways 19'C between Naples yellow and mustard yellow.

Under the microscope it is opaque and amorphous, with a refractive index higher than that of methylene iodide. In the closed tube water is given off, and the mineral blackens but is infusible at full heat of the bunsen.

Results of analyses of the West Australian mineral are shown below, together with analyses of bindheimite from Nevada, Idaho, Idaho, E. V. Shannon, and Bosnia Tscherné.

The mineral from Gorge Creek was first treated with $2E \cdot HNO_3$ and ammonium acetate to remove cerussite and anglesite, there being insufficient mineral for a complete analysis to be made.

ANALYSIS OF BINDHEIMITE.

	1. Gorge Creek.	2. Mt. Amy.	3. Secret Canon, Nevada, Hillebrande.	4. Idaho, E. V. Shannon.	5. Bosnia Tscherné.
	Mols to Bindheimite. %	Mols to Bindheimite. %	Mols to Bindheimite. %	Mols to Bindheimite. %	Mols to Bindheimite. %
Sb ₂ O ₅	38.57	11.9	16.13	35.20	16.5
PbO	32.12	144	59.05	49.50	37.48
H ₂ O +	3.98	{ 100	3.21	164	50.12
H ₂ O -	1.43		.42	{ 320	225
Fe ₂ O ₃	4.43	...	2.32	{ 3.27	37.5
Al ₂ O ₃	7.37	...	4.48	{ 3.84	...
MgO	nil	...	nil	...	...
CaO	...	nil	nil	...	...
Na ₂ O	...	...	.60	...	...
K ₂ O	...	...	.26	...	...
CO ₂	...	...	7.06	...	...
SO ₃	...	...	3.66	...	...
P ₂ O ₅	...	nil	tr.	...	...
CuO	...	nil	1.05	...	...
ZnO	...	...	...	...	...
Ag	...	...	...	...	...
SiO ₂	6.07	...	1.30	4.59	2.28
Total	93.97	...	99.54	100.68	100.31
Formula	...	...	$2PbO \cdot Sb_2O_5 \cdot H_2O$ Lead orthoantimonate	$3PbO \cdot 2Sb_2O_5 \cdot 6H_2O$ Pb orthoantimonate + Pb metantimonate	$2PbO \cdot Sb_2O_5 \cdot 3H_2O$ Pb metantimonate

It will be seen that the ratios of lead, antimony and water vary considerably, but with the exception of 1 (Gorge Creek) correspond to the meta—or ortho—antimonates, or a mixture of these, with varying amounts of water.

On the other hand, many of the published analyses do not conform to any simple formula, and are probably contaminated with antimony ochre, which on account of its stability is a common oxidation product of antimony ores and is practically impossible to separate from a mineral such as bindheimite.

CONCLUSION.

It would seem that it is impossible to assign a definite formula to bindheimite as careful analyses show evidence of both the ortho and meta forms due, no doubt, to the conditions under which the mineral is formed.
